Original Articles

Evaluation of Activity Level and Leg Function for Elderly Patients with Chronic Ischemic Heart Disease in Community Based Health Promotion Program

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Objectives: Lifelong exercise is considered to be beneficial for patients with ischemic heart disease (IHD). In the chronic phase, it is very important that IHD patients continue to exercise according to the guideline. Furthermore, to achieve a significant improvement in cardiorespiratory fitness, approximately 1,400 kcal/week of physical activity has to be expended in patients with IHD at the chronic stage. To achieve target exercise level, leg functions have a big impact for elderly patients. In the present study, we evaluated the activity level and leg functions for elderly patients with IHD in community based cardiac health promotion program.

Methods: Activity level and exercise level were calculated. Knee extension muscle strengths were measured for both legs of patients. Leg muscle thicknesses were estimated by B-mode ultrasound method. A total of 22 elderly patients (74.9±5.3 years) , who had participated in community based ling term rehabilitation program.

Results: Activity level was 1694.2±143.2 kcal/day and exercise energy expenditure was 1350.1±595.0 kcal/week. Leg muscle thickness was 4.60±0.85 cm (Hamstrings). Knee extension muscle strength was 18.40±10.81 kg. Activity level and leg function showed significant relationship ($p<0.05\sim0.01$).

Conclusions: The results showed that leg function affect on activity level for elderly patients in community based cardiac rehabilitation program.

Key wards: Activity Level, Leg Function, Elderly Patients, Ischemic Heart Disease, Community Based Program

(a) Introduction

Ischemic heart disease is one of the common lifestyle-related diseases. Lifelong exercise is considered to be beneficial for patients with ischemic heart disease (IHD)[1)2)3)]. In the chronic phase, it is very important that IHD patients continue to exercise according to the previous study[4)]. Recently there have been many reports about sports and rehabilitation for patients with heart disease. Lin (2003) reported about the health-related quality of life for patients with coronary heart disease. He concluded that QOL for cardiac patients can be significantly improved by a cardiac rehabilitation program[5)]. Kang et al. (2003) reported the effects of aquatic exercise and on–land exercise on hemodynamic responses, physical fitness, and body composition in patients with coronary artery disease[6)]. Mockova (2003) investigated application of the Borg RPE (Rating Perceived Exertion) scale to exercise testing and exercise therapy of cardiovascular patients on beta-blockers[7)].

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Furthermore, to achieve a significant improvement in cardiorespiratory fitness, approximately 1,400 kcal/week of physical activity has to be expended in patients with IHD at the chronic stage[8)]. To achieve such target exercise level, leg functions have a big impact for elderly patients[9)]. Most patients hope to be discharged earlier and go back to their ordinary living routine. Few institutions manage the rehabilitation program on an outpatient basis, and nonsupervised home-based rehabilitation is necessary for patients[10)]. These outpatients should be instructed in the meaning of regular exercise, target energy expenditure, target exercise intensity etc. Brubaker et al. (2002) reported the essentials of prevention and a rehabilitation program for patients with coronary artery disease including pathophysiology and treatment of coronary artery disease[11)]. Their prescription consisted of walking and stationary cycling, with correct control of exercise intensity. Such style of exercise is popular in the USA. Also, the American Association for Cardiovascular and Pulmonary Rehabilitation has many practical reports based on the guideline (Dobrosielski et al., 2002; Schairer et al., 2003)[12,13)]. In the present study, we evaluated the

Table 1. Profile of participants

	Age	Height (cm)	Weight (kg)	BMI	Rehabilitation history (months)
Male Mean±SD	74.9±5.3	162.7±4.9	60.0±6.9	22.7±2.4	240.0±72.2
Female Mean±SD	71.4±3.8	155.6±5.2	57.0±6.1	23.6±2.8	246.2±52.3
Total mean±SD	73.3±4.9	159.5±6.1	58.7±6.6	23.1±2.6	243.1±70.9

Table 2. Daily energy expenditure and energy expenditure in exercise.

	Male	Female	Total
Energy expenditure (kcal/day)	1749.0±157.1	1627.7±93.0	1694.2±143.2
Energy expenditure in exercise (kcal/week)	1503.7±717.4	1167.0±359.0	1350.1±595.0
Energy expenditure in exercise (kcal/day)	214.7±102.6	166.7±51.4	192.9±85.1
Steps (step/day)	8475.0±3744.3	7232.6±2057.3	7910.3±3091.7

activity level and leg functions for elderly IHD patients in community based health promotion program.

(b) Methods

A total of 22 male elderly IHD patients (74.9±5.3 years), who had participated in community based long term health promotion program (Table 1). This program was consisted with regular grouped sport-oriented exercise twice a week. Table tennis, aerobic dance, badminton, soft tennis and walking were conducted at this program[14].

Activity level was measured with the lifecorder (Kens corp.) for 7 days. Steps, energy expenditure (kcal/day) and exercise level (kcal/week) were calculated. Knee extension isometric muscle strengths were measured for both legs of patients with μ Tas MF-01 (anima corp.)

Leg muscle thickness were estimated by B-mode ultrasound methods (Abe et al. 1994) with Logiq book XP (GE Yokokawa Medical System)[15].

The relationship between activity level and leg function was evaluated.

An informed consent of the patients for the study procedure was provided and all of patients agreed with the procedure. The present protocol was conducted according to scientific ethical guideline of this project, individual information and the measured data were protected by this guideline.

The means and standard deviations were calculated for all variables. Pearson's correlation coefficient test was applied for the relationship between activity level and leg function. All P values less than 0.05 were considered significant.

(c) Results

All of the patients completed the measurements without any complications. Table 2 shows the results of daily energy expenditure and energy expenditure in exercise for patients with IHD. The mean energy expenditure during physical activity (1350.1±595.0 kcal/week) was lower than target level (1,400 kcal/week) indicated in previous study[9].

The results of isometric knee extension muscle strength were shown in Table 3. Table 4 shows the results of muscle thickness measured with B-mode ultrasound methods.

There ware significant relationship between leg muscle strength and daily energy expenditure ($p<0.05$) and energy expenditure in exercise ($p<0.05$).

There was also significant relationship between muscle thickness (Hamstrings, Gastrocnemius) and energy expenditure in exercise ($p<0.01$).

(d) Discussion

Cardiac rehabilitation should be conducted with aerobic exercise in many country[16,17]. Generally, leg function and walking capacity should decrease with aging. Especially in patients with IHD, involution of walking capacity and activity level have a big impact for recurrence of IHD.

Muscle thickness estimated by B-mode ultrasound method showed significant relationship with activity level ($p<0.05$). There was not clear relationship between age of patients and activity level in the present study. The leg function showed similar relationship with age of patients. These

Table 3. Results of isometric knee extension muscle strength.

	Male	Female	Total
Knee extension (kg)	23.59±7.22	12.18±6.02	18.40±8.75
Knee extension/body weight (kg/kg)	0.38±0.12	0.22±0.11	0.30±0.14

Table 4. Results of muscle thickness measured with B-mode ultrasound methods.

		Male	Female	Total
Thickness (cm)	Quadriceps	4.16±0.55	4.04±0.73	4.11±0.63
	Hamstrings	4.83±0.78	4.31±0.88	4.60±0.85
	Tibialis anterior	2.80±0.43	2.74±0.32	2.77±0.37
	Gastrocnemius	5.37±0.99	5.36±0.47	5.37±0.78

results showed that leg muscle training is recommended for elderly patients with IHD to promote their health.

In chronic phase of IHD, many sports were adapted for patients with IHD. If they have a high function of lower limbs, grouped sports-oriented programs are recommended for patients. A ski program trial in patients with chronic ischemic heart disease was conducted at a popular ski area[18]. Walk skiing and slide skiing were programmed, and the program was considered to have been completed safely by all patients. Even in cold environments in winter, sport programs seem to be effective for these patients. There are many reports about the evaluation of the intensity of golf play [19-21]. For patients in the chronic phase, programs in the suburbs are useful to enliven their lives and rehabilitation. Shimomura et al. (1999) conducted a clinical study of a swimming program in the pool and sea for patients with ischemic heart disease. This study attempted to apply a swimming program to patients whose physical fitness and favorably recovered during long-term cardiac rehabilitation principally consisting of sports rehabilitation. According to the physiological and clinical exercise data obtained in this study, swimming performed under proper guidance is generally safe for outpatients in the chronic phase of coronary heart disease[22]. Hambrecht et al. (1993) reported the effects of leisure time physical activity on cardiorespiratory fitness and progression of coronary atherosclerotic lesions in patients with coronary artery disease. In the report, they recommended 1,800 kcal/week activity for these patients, and their conclusions has been accepted for rehabilitation programs in many countries[23]. Nakagawa et al. (2005) reported the relationship between the pattern of walking and lifestyle. They analyzed a walk with a foot pressure distribution sensing system and compared the data of cardiovascular patients with those of healthy controls. They suggested the importance of lower leg training for these patients[24].

(e) Conclusion

Leg function affect on activity level for elderly IHD patients in community based health promotion program.

Leg muscle training is recommended for health promotion of elderly patients with IHD.

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